on the subject was the work of an Englishman, now the distinguished president of the Royal Society. Dr. Spottiswoode's "Elementary Theorems Relating to Determinants" appeared in 1851 (4to, pp. viii. + 63, London, Longmans), and, as a pioneer work, was eminently successful; at the honouring request of the editor of *Crelle* it was republished, with additions, in that well-known journal three or four years later (vol. li. pp. 209–271, 328–381). After considerable intervals came Dodgson's "Elementary Treatise" (London, Macmillan, 1867) and a pamphlet by Wright; and here, until quite recently, the list ended. The chapters on the subject by Todhunter and others belong to a different category, but deserve to be mentioned, as it is doubtless in part owing to their existence that separate treatises have been so rare.

In view of the dearth referred to, he would be a very captious critic indeed who would not gladly welcome the handsome volume whose title is given at the head of this notice. In form and general outward appearance it resembles Part I. of Thomson and Tait's "Elements of Natural Philosophy," and extends to about 250 pages. The matter is arranged under fourteen chapters, the first seven being meant to deal with determinants in themselves, the last seven with the so-called applications; the line of separation, however, is not very well maintained.

In the introductory chapter we have the usual account of permutations, inversions of order, &c., and the usual definition of a determinant; but this is followed by something less familiar, viz., a page or two of exposition regarding Grassmann's "alternate units" or "polar elements," and by the establishment of the theorem that a determinant is expressible as a product of alternate numbers linear in the elements.[1] The constant use afterwards made of this theorem—if theorem we can call that which is but a symbolical expression of the ordinary definition of a determinant—is the distinguishing feature of Mr. Scott's mode of treating the subject. There may be room for doubt whether the study of determinants is thus, as he says, much simplified—the example of § 20, p. 15, is not a happy introductory instance of such simplification—and it may certainly be questioned whether beginners should have the subject at first presented to them in this way; but undeniably a freshness is thereby imparted to the book, which will make it pleasant reading to those who already know something of the matters in hand. Chapters II. to V., on "General Properties of Determinants," "The Minors and the Expansion of a Determinant," "Multiplication of Determinants," and "Determinants of Compound Systems," contain proofs and illustrations of *most* of the well-known general theorems. One might, however, fairly expect so large a work as the present to be more complete in this respect; the omissions for example, of Sylvester's beautiful theorem expressing the product of two determinants as a sum of like products is not easily excusable. Chapter VI., on "Determinants of Special Forms," is good, and the same may be said of the next, which treats of "Determinants with Multiple Suffixes." Belonging to the first part, although included under "Applications," are Chapters IX. and XII. The one concerns what are called "Rational Functional Determinants," but which might be more fitly designated as "Alternants"—to use one of Sylvester's happiest coinages; the other concerns "Determinants of Functions of the same Variable," a title again which is anything but sufficiently discriminative. Both chapters are fresh and interesting. To the borderland between the two parts may be assigned Chapter X., on "Jacobians and Hessians;" then there are chapters (VIII., XI., XIII.) dealing with the applications to three departments of Analysis, viz., Theory of Equations, Theory of Quadrics, and Continued Fractions; and, lastly, there is a very readable chapter (XIV.) on "The Applications to Geometry."

No exercises for the student are given under the individual chapters, but a considerable collection is placed towards the end.

Following this is a "List of Memoirs and Works Relating to Determinants," the arrangement being alphabetical according to authors' names. Mr. Scott acknowledges the incompleteness of the list; but, all the same, one cannot help expressing regret that such an excellent opportunity of publishing an exhaustive, or tolerably exhaustive, bibliography of determinants was lost. Had the list been a judicious *selection*, there would have been less cause for regret, but not rarely the worthless are taken and the good left out. Cauchy, who in a sense laid the foundations of the whole subject, is not once mentioned; Grassmann, who laid the foundation of Mr. Scott's method, is not included; Nägelsbach's name occurs, but his most important paper is omitted: and many more such instances might be cited.

Mr. Scott has given us a very acceptable addition to our mathematical text-books: a little more of the conscientious labour he has shown would have produced a work still more worthy of the press which has issued it.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*]

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.*]

The Stone in the Nest of the Swallow

THE name of swallow's stone was preserved in France even to our days, for Dr. Patrin, a member of the French Institute and of the Academy of Sciences in St. Petersburg, wrote in the "Dictionary of Natural History," Paris, Deterville, 1803 (V° Agate), as follows:—

"On trouve dans les ruisseaux des environs de Sassenage en Dauphiné de très petites Calcedoines ou Agates de forme lenticulaire qu'on a nommées *pierres de Chélidoine*, parce qu'elles ont quelque ressemblance avec les semences de cette plante, *pierres d'hirondelle* parcequ'on en a trouvé dans l'éstomac de ces oiseaux."

Of course this naturalist did not try to throw light on the legend, or to explain the confusion made by some authors between the respective skill of the eagles in geology, and of the swallows in botany, which Phile, in his "Remedies Against Sortileges," clearly sets out in the following verses:

φθορᾶs δὲ τηρεῖ τὰs γονὰs ὑπερτέραs
εἰs τὴν καλίαν ἀετὸs κρύψαs λίθον
ὡs ἡ χελιδὼν τοῦ σελίνου τὴν κόμην
'Εξάψασα δὲ τοῦ τραχήλου τὸν λίθον
κυοῦσα γυνὴ κερδαινεῖ ζῶν τὄβρεφοs.

"A stone which the eagle conceals in her nest (aery) preserves

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[1] *E.g.* $\begin{vmatrix} a & b & c \\ d & e & f \\ g & h & k \end{vmatrix} = (a\epsilon_1 + b\epsilon_2 + c\epsilon_3)(d\epsilon_1 + e\epsilon_2 + f\epsilon_3)(g\epsilon_1 + h\epsilon_2 + k\epsilon_3)$, where $\epsilon_1\epsilon_2\epsilon_3 = 1$. and ϵ_1, ϵ_2, ϵ_3 are symbols subject to the laws of ordinary algebra, except that $\epsilon_r\epsilon_s = -\epsilon_s\epsilon_r$, and therefore $\epsilon_r^2 = 0$.

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her lofty breed from destruction, just as the top of a parsley sprig does for the swallows. This stone worn by a woman round her neck during pregnancy will procure her a living child."

This use of parsley is mentioned by Ælianus *de Natura Animal.* lib. i. chap. 37, as follows:—

Aἱ σίλφαι καὶ τουτῶν τὰ ὠὰ ἀδικοῦσιν οὐκοῦν αἱ μητέρες σελίνου κόμην προβάλλονται τῶν βρεφῶν καὶ ἐκείναις τὸ ἐντεῦθεν ἄβατά ἐστιν.

"As the beetles injure their eggs the mothers throw tops of parsley sprigs in front of their young, which become inaccessible to the beetles."

But this parsley must not be confounded with the miraculous herb giving sight to the young swallows. (Ælianus, lib. iii. chap. 25).

Βραδέως δὲ ἐκβλέπει καὶ τὰ ταύτης βρέφη ὡς καὶ τὰ τῶν κυνῶν σκυλάκια· πόαν δὲ κομίζει καὶ προσάγει τὰ δὲ ὑπαναβλέπει εἶτα ἀτρεμήσαντα ὀλιγὸν ἐκπετήσιμα ὄντα πρόεισι τῆς καλίας ἐπὶ τὴν νομὴν. ταύτης τῆς πόας ἄνθρωποι γενέσθαι ἐγκρατεῖς διψῶσι· καὶ οὐδέπω νῦν τῆς σπουδῆς κατέτυχον.

"Like whelps, the young swallows are late endowed with sight, but on the application of a certain herb by their mother they begin to see; and after some rest leave the nest to seek their food. Men, though longing for this herb, could never get it."

Dionysius gives in his "Ornithology" some information about this eagle's stone (lib. i. ch. 3).

Ἣν δὲ ἀποτεκεῖν δέῃ κομίσαντές τινα λίθον ταῖς κοίλαις ἐντιθέασι καλιαῖς ἵνα ἐν καιρῷ τίκτωσι, καὶ μὴ τὸ τικτόμενον πρὸ τῆς ὥρας ἀτέλεστον ὠθοῖτο ὑπ' ἰσχύος· οὐ μὴν ἐστὶ τί σαφὲς περὶ τοῦ λίθου τούτου γινώσκειν, ἀλλ' οἱ μὲν αὐτὸν ἀπὸ τῶν Καυκασίων ὀρῶν οἱ δὲ ἀπὸ τῆς τοῦ ὠκεανοῦ ὄχθης φασὶ κομίζεσθαι λευκὸν ὑπερφυῶς ὄντα καὶ μεστὸν ἔνδοθεν πνεύματος ὡς καὶ ἦχον ἀποτελεῖν εἰ κινοῖτο. τικτούσῃ δ' εἰ τις αὐτὸν γυναικὶ περιάψειε, ὀλισθαίνειν διακωλύσει τὸ βρέφος. κἂν ἐνλέβητι παφλάζοντος ὕδατος ἐπιψαύσῃ τὴν τοῦ πυρὸς νικήσει πάντω ἰσχύν.

"They bring this stone in their nests to avoid a premature and forcible delivery. Nothing positive is known about this stone, which some suppose brought from the Caucasus, and others from the sea-shore. It is exceedingly white, full of air, so as to resound when moved. It prevents miscarriage in those who wear it. And if it does but touch the surface of a caldron of boiling water, it overpowers entirely the might of fire."

The confusion made by some writers between swallows and eagles is evident by the fact of their faulty quotation from Pliny.

For Pliny, chap. iv. lib. x. says—

"Tribus primis et quinto aquilarum generi inædificatur nido lapis *ætites* quem aliqui dixere gangitem ad multa remedia utilis nihil igne deperdens. Est autem lapis iste prægnans intus, cum quatias alio velut in utero sonante. Sed vis illa medica non nisi nido direptis."

And in chap. xxxix. vol. 36, he gives further particulars on these very stones, which he divides into males and females, and into four kinds, according to their origin.

Whilst in lib. viii. chap. 41, he says—

"Chelidoniam visui saluberrimam hirundines monstravere vexatis pullorum oculis illa medentes," and lib. xxv. ch. 50, "Animalia quoque invenere herbas, in primis que chelidoniam. Hac enim hirundines oculis pullorum in nido restituunt visum ut quidam volunt [see Aristotle *de Animal. Gen.* l. iv. ch. 6] etiam erutis oculis"; clearly tracing the distinction followed by Phile between the respective proficiency of eagles in geology and swallows in botany.

Jersey CHATEL

A Peat Bed in the Drift of Oldham

WE have here lately discovered a bed of peat intercalated with beds of undisturbed "glacial drift." I believe this phenomenon, if not unique, is very rare in England, and may, therefore, be interesting to your readers. In the depth of a section of 14 feet there are two thick beds of drift with washings of fine clay, and, midway in the section, a well defined bed of peat with a maximum thickness of 18 inches. Another bed of peat, somewhat less clearly defined, and not so true as the former, is likewise present, the two beds having beneath them a thin band of exceedingly fine clay of a bluish grey colour, which evidently is the equivalent of the "seatings" or "floor clays," which so invariably accompany our seams of coal. The beds of drift that inclose the peat are alike in some of their main features, but unlike in others. In both boulders are in great abundance. In the bed beneath the peat there are bands of fine clay, coarse sand, or grit, pebbles, and boulders; the upper, with very little variation, is uniformly made up of arenaceous clay and a great number of boulders. It is almost certain that at the close of the pleistocene period the upper deposit, that is, the one above the peat, could not have had a thickness of less than 75 feet. These deposits are the "upper drift" of the geologist. The beds beneath the peat, judging from their composition—boulders, pebbles, gravel, and fine sand—and the presence in the latter of "current bedding," probably represent the "middle drift." The "lower drift" beds are absent here. May I add that some of the mosses, which seem to make up the bulk of the peat, are in an excellent state of preservation, and are now under examination for identification. A considerable number of fragments of beetles, of undetermined species, are likewise amongst the finds. JAS. NIELD

29, Radclyffe Street, Oldham, September 13

On the Asiatic Alliances of the Fauna of the Congenian Deposits of South-Eastern Europe

HERR THEODOR FUCHS of Vienna has pointed out some important mistakes in the abstracts of his memoir in NATURE, vol. xxi. p. 528. In view of remedying these regrettable errors some revised extracts are here given. At p. 528, line 32, the passage should read thus:—"The genus *Neritina* at present shows a predilection for islands. Thus from Tahiti alone Reeve gives 8 species, and 11 from the Sandwich Islands; from the Philippines there are 39, and 40 from New Caledonia alone, according to Gassies. Further, according to Kobelt there are 11 in the Mediterranean; and, according to Reeve, 7 in the West Indies, and 10 in Central America. The great continental areas are strangely poor in *Neritinæ*. In North America the genus seems to be wanting, since the two or three known species are found only in the borderlands on the south. The genus *Melanopsis* has a very peculiar distribution. Twenty species, nearly all strongly ornamented, belong to the Mediterranean. This genus is wanting in Africa, East India, the Malay Islands, Australia, and the whole of America; but it occurs quite locally, with 19 species, in New Caledonia; and 2 species are found in New Zealand."

Again, at line 60, read:—"A very peculiar characteristic, hitherto overlooked, in the inland-water faunas of the later tertiaries in South Europe, is the absence of the African element (such as the Achatina, Etheria, Ampullaria, Iridina, Galatea, &c.); and this is the more remarkable because the mammalian fauna of the period, on the contrary, has a strongly-pronounced African character. The same may be said of the flora and for the whole tertiary period, since the tertiary flora of Europe had, in succession, an Australian, Indian, Japanese, and Mediterranean character, but never an African character. The tertiary land and freshwater shells of Europe show analogies to New Caledonia, India, China, and Japan, but not to Africa; although the last not only lies so very much nearer to our continent, but in its mammalian fauna, until the Diluvial period, kept so close a connection with Southern Europe." T. R. J.

Prosopistoma punctifrons

MY colleagues, Messrs. Joly and Vayssière, in announcing with justifiable pride (in the *Comptes Rendus* of the French Academy and elsewhere) the discovery of the perfect insect of *Prosopistoma*, attribute to me the former possession of an opinion that the insect might be an Ephemerid suited for a continuous aquatic life. I am not sensible of having published such an opinion, nor of having held it. In remarks on *Oniscigaster*, in the *Journal* of the Linnean Society of London, vol. xii. (Zoology) p. 145, footnote (1873), I ask, "Can there be apterous *Ephemeridæ?*" and "Can the imago of *Prosopistoma* be in that condition?" It did not occur to me that these words could be so translated as to bear the interpretation put upon them by Messrs. Joly and Vayssière. In congratulating my colleagues upon their discovery, I remark that I make this explanation solely because certain of my correspondents ask *where* I have published the opinion attributed to me. R. MCLACHLAN

Lewisham, September 9

Mosquitoes

IN NATURE, vol. xxii. p. 338, an inquiry is made as to the best means of preventing the attacks of mosquitoes. I am

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